

REMARKS

This amendment is submitted in response to the Office Action dated February 7, 2004. Upon entry of this amendment claims 14, 49 and 52 to 55 are pending. Claims 14 is allowed. Claim 49 is amended to more clearly point out and distinctively claim the invention by further defining the propellant composition. New claims 52 to 55 are added. Support for new claim 52 can be found in the specification and in claim 34 as originally filed. Support for new claims 53 and 54 is found in the specification and figures; specifically, claim 53 corresponds to the composition of Paraffin B, and claim 54 corresponds to the composition of Paraffin A, both described in the specification and experiments, for example at pages 28 and 29, and in Figure 10, where the average melting points are shown. Support for new claim 55 is found in the specification and in original claim 35 which was directed to a propulsion system.

Allowable Subject Matter

Applicant acknowledges with appreciation the allowance of claim 14. To more fully claim the invention, Applicant has added new claims 52 to 54 which depend from allowed claim 14. As claim 14 is allowed, Applicant respectfully requests allowance of dependent claims 52 to 54.

Claim Rejections under 35 U.S.C. §112

The Examiner rejects claim 49 under 35 USC §112, second paragraph. Applicant respectfully traverses this rejection and submits that the amended claim is patentable.

As amended, Claim 49 requires that the propellant be comprised of one or more paraffin waxes that satisfy the a_{onset} equation and have an a_{onset} value of $\leq 0.9 \text{ kg}^{1.6} / (\text{m}^{2.6} \cdot \text{sec}^{1.6})$, in addition to possessing a specific mean carbon number, and specific liquid viscosity and surface tension values. All of the variables of a_{onset} are defined, and a detailed description of its use with examples are found in the specification, for example at pages 20 to 22 and 34 to 35, among others. Given the teaching of the present invention, one skilled in the art can follow the method, make the measurements and calculations to arrive at a propellant that satisfies the claim limitations, without undue experimentation. The fact that experimentation may be complex does not necessarily make it undue particularly if a person skilled in the art typically engages in such experimentation. In re Angstadt, 190 USPQ 216 (C.C.P.A 1976). Applicant respectfully submits that the 112, second paragraph rejection should be withdrawn.

35 U.S.C. 102(b) Rejection

The Examiner rejects Claim 49 under 35 U.S.C. §102(b) as anticipated by Strickler. Applicant respectfully traverse the rejections and submits that claim 49 is patentable over Strickler.

A claim is anticipated under 35 U.S.C. §102 *only* if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. Applicant respectfully submits that the cited reference does not teach each and every element of the amended claims of the present invention.

Strickler teaches a heterogeneous fuel composition having a continuous phase and a dispersed phase distributed therein. The dispersed phase roughens the surface and enhances heat transfer thereby increasing the burn rate of the fuel. Strickler roughens the surface by various means including putting solid particles in the dispersed phase, having voids or bubbles in the dispersed phase, or by encapsulating liquid in a carrier or using an immiscible liquid that is sheared into droplets.

Strickler does not disclose or teach a method of combusting a propellant as recited in Applicants claims. No where does Strickler teach or suggest the entrainment onset parameter a_{onset} . The a_{onset} parameter is not an inherent property of the propellant, but depends on a number of parameters as defined in the equation. Further, claim 49 as amended requires that the a_{onset} parameter be of a value equal or less than $0.9 \text{ kg}^{1.6} / (\text{m}^{2.6} \cdot \text{sec}^{1.6})$. No where does Strickler teach or suggest such a limitation. Applicant respectfully submits that each and every limitation of the present claims are not described in the Strickler reference, and that the rejection should be withdrawn.

35 U.S.C. 103(a) Rejection

The Examiner rejects claim 49 under 35 U.S.C. §103(a) as obvious over Nichols. Applicant respectfully traverses this rejection and submits that the claims are patentable in view of Nichols.

To establish a prima facie case of obviousness, three basic criteria must be met: (1) the prior art must provide one of ordinary skill with a suggestion or motivation to modify or combine the teachings of the references relied upon by the Examiner to arrive at the claimed invention; (2)

the prior art must provide one of ordinary skill with a reasonable expectation of success; and (3) the prior art, either alone or in combination, must teach or suggest each and every limitation of the rejected claims. The teaching or suggestion to make the claimed invention, as well as the reasonable expectation of success, must come from the prior art, not Applicant's disclosure. If any one of these criteria is not met, prima facie obviousness is not established.

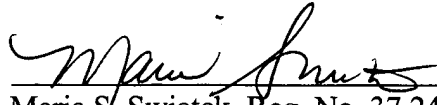
Nichols teaches a rocket propellant provided by modifying a rocket fuel of RP-1 (a kerosene fraction) by addition to, or replacement of, the RP-1 with quadricyclane. In another embodiment, quadricyclane is added to n-Hexane as a fuel composition and then combined with an oxidizer to define a rocket propellant. Quadricyclane can also be used in combination with other hydrocarbons having from 1-20 carbon atoms (see col 2, lines 26 to 28).

Nichols does not teach or suggest a method of combusting a propellant as recited in Applicant's claims. The propellant of Nichols includes the oxidizer added to the fuel to form the rocket propellant, and thus does not achieve combustion by flowing a gas through a port as recited in Applicant's claims. The teaching of Nichols is not directed to a hybrid rocket system. Nichols does not teach or reasonably suggest a propellant having an entrainment onset parameter a_{onset} , nor the specific values of a_{onset} . Nichols does not teach a combustion mechanism that operates by entrainment and Applicant respectfully submits that no where does the teaching of Nichols motivate one to arrive at Applicant's claimed invention.

The propellant recited in Applicant's amended claims is not taught or reasonably suggested in the prior art, and Applicant respectfully submits that the prior art does not inherently possess the features of the claimed invention. Further, as shown earlier in the record, the method recited in Applicant's present claims provided unexpected results. Specifically, Applicant has made of record in the Interview Summary dated August 24, 2002, still photos from a video demonstration showing test firing sequences according to the method of the present invention. As shown therein, the method of the present invention showed remarkably increased regression rates when compared to conventional methods. Such results were unexpected.

Based on the foregoing, Applicant respectfully submits that the application is now in condition for allowance. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned attorney at the telephone number listed below. The Commissioner is authorized to charge any additional fees to Deposit Account No. 50-2319 (Order No. A-67587-1/AJT/MSS (468330-1208)).

Respectfully submitted,



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